What is claimed is:

1. A frequency offset controller for correcting a frequency offset in a transmitted signal, the offset equivalent to a phase rotation of the transmitted signal, the controller comprising:

a multiplier having a first and second input, for receiving at the first input the transmitted signal, and for providing at an output the product of the first and second input;

a frequency estimator, for receiving the output of the multiplier, for deriving an estimate of the frequency offset in the transmitted signal in accordance with the received multiplier output; and

a signal generator, for receiving from the frequency estimator the estimate of the frequency offset, for generating a sinusoidal signal having a frequency determined in accordance with the received frequency offset estimate, for feeding back the generated sinusoidal signal to the second input of the multiplier to correct the phase rotation of the transmitted signal received at the first input by rotating the transmitted signal in accordance with the generated sinusoidal signal.

2. The controller of claim 1, further including a symbol timing recovery unit for receiving the output of the multiplier, for sampling the output of the multiplier, for generating a resampled signal having a maximum eye opening in the output signal eye diagram in accordance with the sampled output of the multiplier, and for providing the resampled signal to the frequency estimator.

3. The controller of claim 2, further including a matched filter for receiving the resampled signal from the symbol timing recovery unit, for filtering out-of-band noise from the received resampled signal, and for providing the filtered resampled signal to the frequency estimator.

4. The controller of claim 3, wherein the multiplier is a discrete multiplier, the frequency estimator is a discrete estimator, the signal generator is a discrete signal generator the symbol timing recovery unit is a is a discrete symbol timing recovery unit, and the matched filter is a square root raised cosine filter.

5. The controller of claim 3, further including a filter for receiving the output of the multiplier, for filtering out-of band noise from the output of the multiplier, and for providing the filtered output of the multiplier to the symbol timing recovery unit.

6. The controller of claim 5 wherein the filter is a low pass filter.

7. The controller of claim 1 wherein the frequency estimator includes an amplitude based estimator for generating a frequency offset estimate in accordance with the amplitude of the in-phase and quadrature of the signal received by the frequency estimator.

8. The controller of claim 7, wherein the amplitude estimator includes means to generate the frequency offset estimate as

$\hat{f}_{c,raw}[n] = (I[n] - I[n-1]) \times Q[n] - (Q[n] - Q[n-1]) \times I[n]$ where $I[n]$ and $Q[n]$ are the amplitudes of the in-phase and quadrature components of the input to the frequency estimator at discrete time index n.

9. The controller of claim 7 wherein the amplitude estimator includes means to generate a filtered frequency offset estimate by averaging a plurality of previous estimates with the current estimate.

10. The controller of claim 9, wherein the frequency estimator includes bias and slope determining means, for determining the bias and slope as polynomials of a known symbol rate for the transmitted signal, and for generating a frequency offset estimate as a function of the filtered frequency offset, the bias and slope.

11. The controller of claim 1, wherein the signal generator includes a numerically controlled oscillator for generating a sinusoid signal whose frequency is the complex conjugate of the estimate of the frequency offset.

12. A method for correcting a frequency offset in a received signal, the offset equivalent to a phase rotation, the method comprising:

initializing a frequency offset estimate signal to a multiplicative unity value;

multiplying the received signal by the frequency offset estimate signal;

estimating the frequency offset of the transmitted signal in accordance with the product of the received signal and the frequency offset estimate signal;

generating a frequency offset estimate signal in accordance with the frequency offset estimate, the frequency offset estimate signal for rotating the received signal by the frequency offset estimate to correct the frequency offset in the received signal; and

feeding back the frequency offset estimate signal to the step of multiplying the received signal by the frequency offset estimate signal.

13. The method of claim 12 including the step of resampling the received signal prior to estimating the frequency offset, to generate a resampled signal having a maximum eye opening in the output signal eye diagram, the resampled signal for use in the step of estimating the frequency offset.

14. The method of claim 13 including the step of filtering the resampled signal, prior to its use in the step of estimating the frequency offset, to reduce out-of-band noise.

15. The method of claim 14 including the step of filtering the product of the received signal and the frequency offset estimate signal, prior to its use in the step of resampling, to reduce out-of-band noise.

16. The method of claim 12 wherein the step of estimating the frequency offset includes generating the frequency offset estimate in accordance with the amplitude of the in-phase and quadrature of the product of the received signal and the frequency offset estimate signal.

17. The method of claim 16, wherein the step of estimating the frequency offset includes calculating the frequency offset estimate as

$\hat{f}_{c,raw}[n] = (I[n] - I[n-1]) \times Q[n] - (Q[n] - Q[n-1]) \times I[n]$ where $I[n]$ and $Q[n]$ are the amplitudes of the in-phase and quadrature components product of the received signal and the frequency offset estimate signal at discrete time index n

18. The method of claim 17 wherein the step of estimating the frequency offset includes averaging a plurality of previous estimates with the current estimate to obtain a filtered frequency offset estimate.

19. The method of claim 18 wherein the step of estimating the frequency offset includes calculating the frequency offset as a function of the filtered frequency offset, and the bias and slope polynomials of a known symbol rate associated with the received signal.

20. The method of claim 12 wherein the step of generating a frequency offset estimate signal includes generating a signal having as its frequency the complex conjugate of the frequency offset estimate.

21. A frequency estimator for estimating the frequency offset of a received signal, the estimator comprising:

an amplitude based estimator for generating a frequency offset estimate in accordance with the amplitude of the in-phase and quadrature of the received signal.

22. The frequency estimator of claim 21 wherein the amplitude estimator includes means to generate the frequency offset estimate as

$\hat{f}_{c,raw}[n] = (I[n] - I[n-1]) \times Q[n] - (Q[n] - Q[n-1]) \times I[n]$ where $I[n]$ and $Q[n]$ are the amplitudes of the in-phase and quadrature components of the input to the frequency estimator at discrete time index n.

23. The frequency estimator of claim 22 wherein the amplitude estimator includes means to generate a filtered frequency offset estimate by averaging a plurality of previous estimates with the current estimate.

24. The controller of claim 23, further including bias and slope determining means, for determining the bias and slope as polynomials of a known symbol rate for the transmitted signal, and for generating a frequency offset estimate as a function of the filtered frequency offset, the bias and slope.